## Programmable Controller S5 110S/B

$\frac{\text { E811- STANDEXEMPLAR }}{\text { Manual }}$

| Issue 2 |  |
| :--- | :--- |
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## SIEMENS



SIMATIC S5-110S/B
Programmable Controller

## SIEMENS



Fig. 1 S5-110S programmable controller. On the left: Central controller. On the right: I/O modules. In the foreground: the 670 programming unit.

## 1. Description

### 1.1 Application <br> 1.2 Construction

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### 1.1 Application

The 110 S programmable controller (PC) is part of the SIMATIC S5 System.
It is designed for automation tasks in the middle and upper performance ranges. The degree of expansion and the range of functions are matched to the typical requirements in these ranges.

The PC can be easily adapted to the required tasks on account of its expandibility.

Combination with other SIMATIC programmable controllers and hard-wired controllers is possible.

### 1.2 Construction

The 110 S is available in various basic versions and can be equipped with different power supply units ( $220 \mathrm{VAC} / 240 \mathrm{VAC}$, 115 V AC or 24 V DC). The programmable controller is designed for operation without fans.

The modules are accommodated in a rugged housing, which can be mounted without difficulty in electronic cabinets and which is also suitable for wall mounting. The modules are interconnected via the flow-soldered backplane PCB located in the rear wall of the housing. Connectors with 48 or 64 pins are used in the backplane PCB.

The programmable controller uses the familiar digital input/ output modules of the 110 A PC range. These modules are available in $24 \mathrm{~V} \mathrm{AC/DC}, 48 \mathrm{~V} \mathrm{AC/DC}, 115 \mathrm{~V} \mathrm{AC}$ and 220 V AC versions and contain either 8 inputs or 8 outputs each. The modules are mounted on a separate mounting rack and controlled directly from the CPU.

In addition, module locations 3, 4, 5 or 6 of the central controller in Fig. 3 can also be used for digital/analog peripheral I/O modules (compact version 20 mm wide), the 302 serial peripheral interface module and the MC210 monitor interface module.
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Fig. 2 Application of the S5-110S programmable controller


Fig. 3 S5-110S central controller (equipped with power supply unit and CPU module)
1 Power supply (PS) ( $220 \mathrm{~V} \mathrm{AC} / 240$ V AC; 115 V AC or 24 V DC)
2 CPU
3 Test module
4 Memory module 340 (RAM) or 350 (RAM/EPROM)
PU interface module 511
6 Interface module 512C

110S Programmable controller


Fig. 4 Block diagram of the S5-110S programmable controller

## 1. Description

### 1.3 Principle of operation



## Function diagram



## 1. Description

### 1.4 Technical specification

### 1.4 Technical specification

### 1.4.1 General data of the $\mathbf{1 1 0 S}$ programmable controller

Input voltage:

Current input:

Ambient According to SN 26556 B, the air intake
temperature:

Humidity rating:
a) $220 \mathrm{~V} / 240 \mathrm{~V} \mathrm{AC}$
b) 115 V AC
c) 24 VDC
c) 24 VDC
a) 0.6 A at 220 V AC
b) 1.2 A at 115 V AC
c) 3.2 A at 24 VDC

Degree of protection: IP 20 to DIN 40050.
Shock test:
to SN 29010, class 13.

| Frequency <br> range <br> Hz | Constant amplitude of the |  |
| :--- | :--- | :--- |
| 10 to 58 | displacement | acceleration |
| over 58 to 500 | 0.15 mm |  |

Shock test:
$15 \mathrm{~g} / 11 \mathrm{~ms}$, trapezoidal to DIN 40046, Section 7.

All parts of the central controller are connected galvanically to each other. In order to achieve effective electromagnetic shielding, all the parts are connected to each other through low resistance paths. I/O modules are galvanically isolated.


Fig. 5 Power supply units $\quad$ a) 220 V AC/240V AC $\quad$ b) 24 VDC

### 1.4.2 Power supply unit with housing

| Power supply | 6ES5 932-3SA12 | 6ES5 932-3SA22 | 6ES5 932-3SA32 |
| :---: | :---: | :---: | :---: |
| Input voltage <br> Tolerance of the input voltage <br> Permissibe mains frequency range <br> Current input for rated load <br> Max. input current <br> Fuse <br> Output voltage <br> Rated current $I_{A N}$ <br> Maximum output power <br> Overvoltage protection <br> Current limiting <br> Galvanic isolation between input and output circuits <br> Back-up battery <br> Battery voltage <br> Life of back-up battery <br> Back-up period <br> Connection for monitoring the 24 VDC load voltage <br> Weight of the PSU with housing | $\begin{aligned} & 220 \mathrm{~V} \mathrm{AC} \text { or } 240 \mathrm{~V} \mathrm{AC} \\ & +10 \%,-15 \% \\ & 48 \text { to } 63 \mathrm{~Hz} \\ & 0.6 \mathrm{~A} \\ & \text { approx. } 0.9 \mathrm{~A} \\ & 0.8 \mathrm{~A} \\ & +5 \mathrm{VDC} \pm 1 \% \\ & 10 \mathrm{~A} \\ & 50 \mathrm{~W} \\ & 6 \mathrm{VDC}+4 \% \\ & 1.05 \times \mathrm{I}_{\mathrm{AN}} \\ & \text { yes } \\ & \text { Lithium } \\ & \text { approx. }+3.4 \mathrm{~V} \text { DC/5 Ah } \\ & 6 \text { years } \\ & 1 \text { year at } 25^{\circ} \mathrm{C} \\ & \text { yes } \\ & 9.5 \mathrm{~kg} \end{aligned}$ | $\begin{aligned} & 115 \mathrm{~V} \mathrm{AC} \\ & +10 \%,-15 \% \\ & 48 \mathrm{~Hz} \text { to } 63 \mathrm{~Hz} \\ & 1.2 \mathrm{~A} \\ & \text { approx. } 1.8 \mathrm{~A} \\ & 1.6 \mathrm{~A} \\ & +5 \mathrm{VDC} \pm 1 \% \\ & 10 \mathrm{~A} \\ & 50 \mathrm{~W} \\ & 6 \mathrm{VDC}+4 \% \\ & 1.05 \times \mathrm{I}_{\mathrm{AN}} \\ & \text { yes } \\ & \text { Lithium } \\ & \text { approx. }+3.4 \mathrm{DC} / 5 \mathrm{Ah} \\ & 6 \text { years } \\ & 1 \text { year at } 25^{\circ} \mathrm{C} \\ & \text { yes } \\ & 9.5 \mathrm{~kg} \end{aligned}$ | ```24 VDC \(+25 \%,-17 \%\) 3.2 A 3.3 A \(+5 \mathrm{VDC} \pm 1 \%\) 10 A 50 W 6VDC +4\% \(1.05 \times \mathrm{IAN}\) no Lithium approx. \(+3.4 \mathrm{VDC} / 5 \mathrm{Ah}\) 6 years 1 year at \(25^{\circ} \mathrm{C}\) no 6.7 kg``` |

### 1.4.3 CPU / Memory submodule

| DC voltage supply: | $+5 \mathrm{~V}+1 \%$ |
| :--- | :--- |
| Current input typ.: |  |
| max: | 1.6 A |
|  | 2.6 A |


| Bus driver (110 bus): | designed for driving max. 64 input/output modules |
| :---: | :---: |
| Range of operations: | 45 binary statements |
|  | 13 block call and jump statements |
|  | 14 timer and counter statements |
|  | 27 load and transfer statements |
|  | 16 organizational statements |
|  | 21 digital substitution statements |
|  | 17 logical and arithmetic statements |
| Adressing range: | max. 512 inputs/outputs |
|  | 1024 retentive flags ( $0.0 \ldots 127.7$ ) |
|  | 1024 non-retentive flags |
|  | (128.0 .. 255.7) |
|  | 128 integrated timers each with one of |
|  | 4 optional time bases |
|  | 0.01 s |
|  | 0.1 s |
|  | 1 s |
|  | 10 s |
|  | Time base 0... 999 |
|  | 128 integrated counters from 0... 99 |
| Memory: | 1 K statements for operating system |
|  | $1 / 2 \mathrm{~K}$ statements user RAM |
|  | 1 EPROM memory submodule for the |
|  | user program consisting of: |
|  | $1 \times 2532$ up to 2 K statements |
|  | $2 \times 2532$ up to 4 K statements |
|  | $4 \times 2532$ up to 8 K statements |
| Weight: | approx. 1100 g |

### 1.4.4 511/512 interface module and 340 or 350 memory module

a) PU interface module 511

DC supply voltage:
$+5 \mathrm{~V}$
Current input (typical):
1.7 A

Weight:
approx. 300 g
b) Interface module 512C DC supply voltage:
$+5 \mathrm{~V}$
Current input (typical):
Weight:
1.6 A
approx. 300 g


Fig. 6 CPU


Fig. 7 a) 340 memory module, b) 511 PU interface module, c) 512 C interface module

### 1.4 Technical specification

c) Memory module 340 (RAM)

8 or 16 K statements
DC supply voltage: +5 V
Current consumption (typ.):
Current consumption
in backup operation:
Approx. weight:
d) Memory module 350 (RAM/EPROM)

4 K statements (RAM) and 2 K to 12 K statements (EPROM)
DC supply voltage:
Current consumption:
(memory submodule 370/371:
Current consumption in backup operation:
Approx. weight:
0.8 or 0.9 A
max. 0.6 or 1 mA 300 g
$+5 \mathrm{~V}$
max. 1.4 A
0.27 A each)
max. 0.3 mA
300 g
1.4.5 Digital/analog compact peripheral I/O modules, 302 serial peripheral interface module and 210 monitor interface module
a) Digital I/O compact modules (only 20 mm wide)

Digital I/O compact modules with 16 to 32 inputs/outputs (also as mix) can be plugged into locations 3, 4, 5 or 6 in the central controller (Fig.3).
DC supply voltage:
Current consumption:
5 V
approx. 0.2 A
approx. 200 g
b) Analog I/O compact modules

Analog I/O compact modules with 4 to 16 input/output channels can be plugged into locations $3,4,5$ or 6 in the central controller (Fig. 3).
DC supply voltage:
Current consumption:
Weight:

5 V
approx. 0.3 A
approx. 200 g
c) 302 serial peripheral interface module

The 302 interface module can be plugged into locations 3, 4,
5 or 6 in the central controller (fig. 3). However, only one expansion unit (EU182) may be connected to each connector.
DC supply voltage:
5 V
Current consumption: 2 A
approx. 300 g
d) 210 monitor interface module

The 210 monitor interface module from the ESU902 packaging system can be plugged into location 3 in the central controller (Fig. 3). The image memory is a 2 K byte RAM.
DC supply voltage:
$+5 \mathrm{~V}$
Current consumption:
1.2 A

Weight:

### 1.4.6 I/O modules (digital inputs/outputs)

The following I/O modules are available: Input modules
Output modules
(Dimensions $\mathrm{H} \times \mathrm{W} \times \mathrm{D}: 166 \mathrm{~mm} \times 40 \mathrm{~mm} \times 150 \mathrm{~mm}$ )
The input/output modules described on the following pages are identical to those of the 110 A PC.

The modules are snapped onto a mounting rack. This consists of a 75 mm high standard sectional rail with either ten or eighteen socket connectors wired up to the 110 bus.

The socket connectors for the input/output modules are wired according to their mounting locations, i.e. a module on the first I/O mounting location has the address 0 (see diagram on p.30).
The modules are simply snapped onto the module mounting rail. This simultaneously establishes the electrical connection between the module and the socket connector.

The maximum I/O configuration consists of 16 racks each with 8 module locations or 8 racks each with 16 module locations.

Each input/output module has 8 inputs or 8 outputs.
Five different versions of the digital input module are available:
a) 24 VDC
b) 24 VDC with interrupt processing (group signal)
c) $48 \mathrm{~V} \mathrm{AC/DC}$
d) 115 V AC
e) 220 V AC

Digital output modules are available in five different versions:
a) 24 VDC 2 A
b) 48 VDC 2 A
c) $24 \mathrm{~V} \mathrm{AC} / 48 \mathrm{~V} \mathrm{AC} 2 \mathrm{~A}$
d) 115 VAC 2 A
e) 220 VAC 2 A

The signals in the input/output modules are galvanically isolated by opto-couplers. The signal states of the inputs or outputs are indicated on the front of the modules by light-emitting diodes.

```
SIMATIC S5-110 input/output modules, 1024 inputs/outputs (max.)
```



Fig. 8 I/O modules

| Digital input modules | 6ES5 400-7AA13 | 6ES5 401-7AA13 | 6ES5 405-7AB11 | 6ES5 405-7AB21 | 6ES5 405-7AB31 |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Number of inputs Galvanic isolation | $\begin{aligned} & 8 \\ & \text { yes } \end{aligned}$ | 8 (with group signal) | $\begin{array}{\|l} 8 \\ \text { yes } \end{array}$ | $\begin{array}{\|l} \hline 8 \\ \text { yes } \end{array}$ | $\begin{aligned} & 8 \\ & \text { yes } \end{aligned}$ |
| Input voltage $U_{N}$ | 24 V DC |  | 115 V AC/DC | 220 V AC/DC | $48 \mathrm{~V} \mathrm{AC/DC}$ |
| Input voltage corresponding to <br> - "0" signal <br> - "1" signal | $\begin{aligned} & -35 \mathrm{~V} \text { to }+4.5 \mathrm{~V} \\ & +13 \mathrm{~V} \text { to }+35 \mathrm{~V} \end{aligned}$ |  | 0 to $40 \mathrm{VAC} / \mathrm{DC}$ $85 \mathrm{VAC} / \mathrm{DC}$ to 132 V AC/DC | 0 to $70 \mathrm{~V} \mathrm{AC/DC}$ $170 \mathrm{~V} \mathrm{AC/DC}$ to 264 V AC/DC | 0 to $18 \mathrm{~V} \mathrm{AC} / \mathrm{DC}$ $38 \mathrm{~V} \mathrm{AC/DC}$ to $65 \mathrm{VAC} / \mathrm{DC}$ |
| Input current at "1" signal <br> - connectable proximity switches | $\mathbf{8 . 5} \mathbf{~ m A}$ DC BEROs | 8.5 mA | $10 \mathrm{~mA} \mathrm{AC}, 5.7 \mathrm{~mA} \mathrm{DC}$ AC BEROs | $15 \mathrm{~mA} \mathrm{AC}, 2.4 \mathrm{~mA} \mathrm{DC}$ | $13 \mathrm{~mA} \mathrm{AC}, 12 \mathrm{~mA} \mathrm{DC}$ |
| Delay on signal change <br> - ON: "0" $\rightarrow$ "1" <br> - OFF: "1" $\rightarrow$ "0" | 1.5 ms to 5 ms <br> 1.5 ms to 5 ms |  | 2.3 ms to 13 ms <br> 2.0 ms to 20 ms |  |  |
| Total load capability at $1.2 U_{\mathrm{N}}$ | $100 \%$ referred to sum all inputs | of currents of | $75 \%$ referred to sum of curr | ents of all inputs |  |
| Max. permissible length of leads <br> - in common cable | 1000 m at $24 \mathrm{~V} / 48 \mathrm{~V}$ AC | /DC |  |  |  |
|  | 100 m at 115 VAC <br> 50 m at 220 VAC |  | 500 m at $115 \mathrm{VAC} / \mathrm{DC}$ <br> 250 m at 220 V AC/DC | $\begin{array}{ll} 100 \mathrm{~m} \text { at } & 115 \mathrm{VAC} \\ 500 \mathrm{~m} \text { at } & 220 \mathrm{VAC} \end{array}$ | $\begin{array}{ll} 400 \mathrm{~m} \text { at } & 115 \mathrm{VAC} \\ 200 \mathrm{~m} \text { at } & 220 \mathrm{~V} \mathrm{AC} \end{array}$ |
| - with cables run separately max. | 600 m |  | 600 m |  |  |
| Insulation voltage to VDE 0160 | Internal 5 V voltage to external input voltage: Inputs/outputs of one module with respect to each other |  |  |  |  |
| - for rated value <br> - tested with | $\begin{aligned} & 36 \mathrm{VDC} \\ & 500 \mathrm{~V} \mathrm{AC} \end{aligned}$ | O | $\begin{aligned} & 250 \mathrm{~V} \mathrm{AC/DC} \\ & 2000 \mathrm{~V} \mathrm{AC} \end{aligned}$ | \& |  |
| Weight approx. | 0.39 kg |  | 0.4 kg |  |  |

The 24 V DC input module with interrupt can be mounted in locations $0,16,32$ or 48 . These input modules supply a group signal to the CPU when the signal state on an input changes from " 0 " to " 1 " or vice versa (can be switched on the input module via two externally accessible switches for each group of four inputs).

## 1. Description

### 1.4 Technical specification

| Digital output modules, static | 6ES5 410-7AA11 | 6ES5 410-7AA21 | 6ES5 415-7AB11 | 6ES5 415-7AB21 | 6ES5 415-7AA31 |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Number of outputs | 8 | 8 | 8 | 8 | 8 |
| Galvanic isolation | yes | yes | yes | yes | yes |
| Supply voltage $U_{S}$ <br> - rated value <br> - permissible range <br> Output current at " 1 " signal |  |  |  |  |  |
|  | 24 VDC | 48 V DC | 115 V AC | 220 V AC | 24 V AC to 48 V AC |
|  | 3 VDC to 33 VDC | 3 V DC to 53 V DC | 88 V AC to 132 V AC | 176 V AC to 264 V AC | 20 VAC to 65 VAC |
|  | 2 A | 2 A $\mathbf{0 . 5} \mathrm{A}$ <br> resistive <br> inductive  | 2 A | 2 A | 2 A |
| Short-circuit protection | Fuse (module 6ES5 410-7AA21, only current limited up to 24 V and with resistive load) |  |  |  |  |
| Limitation of voltage induced on circuit interruption | $\begin{array}{l\|l} \text { at } U_{S}=30 \mathrm{VDC:} & \text { at } U_{S}=53 \mathrm{VDC:} \\ -17 \mathrm{~V} & -13 \mathrm{~V} \end{array}$ |  | switch-off at $/=0$ |  |  |
| Switching frequency <br> - resistive loads <br> - lamps <br> - inductive loads |   <br> 100 Hz 11 Hz <br> 11 Hz 11 Hz <br> 2 Hz 0.1 Hz |  | 20 Hz 11 Hz 2 Hz |  |  |
| Total load capability | $100 \%$ at $20^{\circ} \mathrm{C}\left(50 \%\right.$ at $\left.55^{\circ} \mathrm{C}\right)$ (with respect to sum of the currents of all outputs) |  |  |  |  |
| Residual current at <br> " 0 " signal <br> max. | 1 mA | 5 mA | 8 mAAC | 10 mA AC | 5 mAAC |
| Signal level of outputs <br> - "1" signal | $U_{s}-1.8 \mathrm{~V}$ |  | - |  |  |
| Insulation voltage rating to |  |  |  |  |  |
| VDE 0160 | Internal 5 V DC voltage to external input voltage, inputs and outputs of a module with respect to each other |  |  |  |  |
| - tested with | 500 VAC |  | 2000 V AC |  | 1500 V AC |
| Weight approx. | 0.68 kg |  | 0.68 kg |  |  |
| Notes | Digital input modules with the same voltage can be driven (see page 9) |  |  | Contactors of 3 T range cannot be driven |  |


| Digital output modules <br> with relays | 6ES5 417-7AA11 |  |
| :--- | :--- | :--- | 6ES5 417-7AA21

NB: Relay modules require an additional internal 24 VDC power supply. (These power supplies are snapped at the end of the I/O mounting rack.)

### 2.1 General

The following guidelines should be adhered to when wiring:

- The mains cables must be kept as far away as possible from the remaining cables.
- The M connection from the load power supply to the $\mathrm{M}_{\text {ext }}$ terminal should be made via a short connecting wire (see Fig. 11).
- 24 V lines (input/output modules, power supply) and 220VAC lines (input/output modules, power supply) should be run separately or bundled separately.
- If the 110 S programmable controller is mounted inside a cabinet, the side sections and the door must have a low resistance interconnection. The cabinet must be connected to the PE conductor.
- The housing for the input/output modules should be connected via a low resistance path to $\mathrm{M}_{\text {ext }}$ terminal of the CC housing (conductor cross-section $2.5 \mathrm{~mm}^{2}$ ).


## Caution

The modules of the 110S programmable controller should not be inserted or removed with the power on.

### 2.2 Central controller (CC)

The central controller can be mounted in cabinets with dimensions specified in inches, cabinets with metric units or on any vertical mounting surface.

The central controller should be mounted above the input/output modules. If the maximum configuration is used, the CC should be mounted between the second and third input/output mounting racks in order to keep the bus cable to the I/Os as short as possible and minimize external interference.


Fig. 9 110S central controller (with full module complement)


Fig. $10 \quad 110$ S central controller dimension drawing

## 2. Installation

### 2.2 Central controller

### 2.2.1 Power supply (PS)

The power supply ( $220 \mathrm{~V} \mathrm{AC}, 115 \mathrm{~V} \mathrm{AC}$ or 24 V DC) should be connected according to the type of power supply used. The 24 V load voltage monitoring circuit should also be connected. If the 24 V load voltage monitoring is to be switched off, as is always required when using 220 VAC I/Os, two additional terminals next to the load voltage monitoring input have to be shortcircuited. There is never any load voltage monitoring in the 24 V DC power supply. For thermal reasons, the power supply unit is an integral part of the housing and cannot be removed.

The battery can be replaced by unscrewing the cover (1) and removing the battery. The battery should be changed at least once a year.

To prevent the battery from discharging when not in use, it must be correctly inserted (+ pole pointing to the front) when putting the programmable controller into operation.

In the case of the 24 V power supply, the negative potential is always connected to earth ()$\left._{5}\right)$.


Fig. 11 Mains connections of the power supply unit


Fig. 12 Power supply unit

### 2.2.2 CPU / memory submodule

One or more front connectors are used for connecting up the 110 bus for the digital I/Os. Each front connector (1) connects a maximum number of 128 input/output modules to the CPU

The connector designation (2) on the CPU corresponds not only to the numbering of the digital inputs/outputs (seep. 28) but also designates the I/O parameters during programming.

A maximum of 512 inputs/outputs can be accessed by the CPU, using all four front panel connectors.

The memory submodule (3) for the CPU has optional capacities of $2 \mathrm{~K}, 4 \mathrm{~K}$ or 8 K statements.

The CPU is plugged in as follows: The module is pushed onto the guides of the housing as far as possible until the two knurled screws (4) grip. The module is then evenly pushed into the connector, using these screws.

The CPU and memory submodule must not be removed or inserted with the power supply turned on.

Do not touch the components or etched conductors with the hands or fingers! This can cause, destruction of the MOS chips!


### 2.2.3 Interface module 511 and 512C

The 110S PC has locations for two interface modules. The 511 interface module is used for connecting the 670/675 programming unit. When using the 511 interface module, make sure that jumper 8 is connected and jumper 9 is open. (Changeover from 10 MHz operating frequency to 2 MHz .)

The 512C interface module is used for connecting keyboard printers, process computers, CRT monitors and other programmable controllers of the S 5 family. Exact details are given in the description of the 512C interface module (jumper assignments, switch position).

Caution: The connecting lead for the 670 PU and the 511 interface module should not be used for connecting the 512C module.

The 110 S can only be used with software version 08 of the 511 interface module and software version 07 of the 670 PU .


Fig. 13 CPU


Fig. 14511 and 512C interface modules
2. Installation

### 2.2 Central controller

### 2.2.4 $\mathbf{3 4 0}$ or 350 memory module

There are two different memory modules available:

- the 340 RAM module with 8 or 16K statements
- the 350 RAM/EPROM module with 4 K statements (RAM) and 2 to 12 K statements (EPROM)

The memory modules are used to extend memory space for data and user programs.

In the case of the 340 RAM module, jumpers 2, 6, 9 and 10 must be inserted. Jumpers 5-12 and 7-11 on address coding socket 51 must also be inserted for 8 K and jumpers 6-11 and 7-10 for 16K statements.

If the 350 RAM/EPROM module is used, jumpers 3 and 6 must be inserted. On the RAM address coding socket, jumpers 4-13 and 5-12 must be inserted.

Coding socket 19 (memory submodule 1) and coding socket 26 (memory submodule 2) are used for addressing the EPROM submodules. If memory submodule 1 (3) is used, jumpers 6-11 and $7-10$ must be inserted on coding socket 19. Depending on the configuration of memory submodule 2 (4), the following jumpers must be inserted on coding socket 26 :

| Configuration of memory <br> submodute 7 | 2 K statements | 4 K statements | 8 K statements |
| :--- | :--- | :--- | :--- |
| Jumper assignment on <br> coding socket 26 | $6-11,7-10,8-9$ | $5-12$ | $5-12,7-10$ |
| Max. configuration of <br> memory submodule 2 | 8 K statements | 8 K statements | 4 K statements |

If the memory submodules are used on the 350 RAM/EPROM module, one EPROM submodule with 8 K statements must always be plugged into the CPU of the PC even if it does not contain an user program.
If the user program is in the RAM, it is advisable to transfer it to a floppy disk of the programming unit before switching the PC off, otherwise the user program might be lost should the battery fail.

When installing the two interface modules and the memory modules, a frame (1) must be slipped over the front cover in order to be able to plug the modules in and withdraw them without having to apply force, using the two knurled screws (2).

### 2.2.5 Digital I/O compact modules

512 digital inputs and 512 digital outputs of the rugged " $A$ " type 110 A peripheral I/Os can be connected to the central controller of the PC (see 2.2.9 peripheral I/O modules). If this number of digital inputs and outputs is insufficient, the digital I/O compact modules can be plugged into locations $3,4,5$ or 6 in the central controller (Fig. 3) or into the 182 expansion unit (only serial interface possible).

These compact modules can only be addressed from address 64 $\left(40_{\mathrm{H}}\right)$ to $127\left(7 \mathrm{~F}_{\mathrm{H}}\right)$. This makes it possible to address a further 512 digital inputs and 512 digital outputs. However, as these modules were not originally designed for the 110S PC, the process image exchange must be executed by the user program itself. This means that, at the beginning of organisation block OB1, the process input image must be renewed and the process output image transferred to the peripherals at the end of OB1. Only peripheral I/Os may be referenced which are actually connected, otherwise the PC will enter the "Stop" state due to


Fig. 15 Memory module
a) 340 (RAM)
b) 350 (RAM/EPROM) with memory submodules


### 2.2.6 Analog I/O compact modules

Analog I/O compact modules can only be plugged into the central controller (locations 3, 4, 5 or 6, Fig. 3) or into a 182 expansion unit (only serial interface possible).

Like the digital I/O compact modules, the analog I/O compact modules can only be addressed from address $64\left(40_{H}\right)$ to 127 $\left(7 \mathrm{~F}_{\mathrm{H}}\right)$. See the operating instructions for "Analog I/O modules (compact version)" for notes on jumpering and modification of input range.

### 2.2.7 $\mathbf{3 0 2}$ serial peripheral interface module

The 302 serial peripheral interface module can be plugged into the locations 3, 4, 5 or 6 of the central controller (Fig. 3). This interface makes it possible to address three 182 expansion units or three 110 s racks via a 311 interface module. Each 182 expansion unit with a 311 interface module can be further expanded with the 300 and 312 interface modules. It must be ensured that the analog modules are plugged into the 182 expansion unit containing the 311 interface module, whereas digital modules can be plugged into any parallel expansion unit. The 110 S racks with the 311 interface module can be extended with further 110 S racks.

Addressing on the 302 interface module for digital/analog peripheral $\mathrm{I} / \mathrm{Os}$ starts at address $64\left(40_{H}\right)$ and can go as far as address $127\left(7 \mathrm{~F}_{\mathrm{H}}\right)$ (see 2.2.5, 2.2.6). For further details, see the operating instructions "Serial interface between central controller and expansion unit".

### 2.2.8 MC210 monitor interface module

The 210 monitor interface module can be plugged into location 3 in the central controller (Fig. 3). This interface module makes it possible to operate a monochrome monitor with BAS input (BNC socket) via a $75 \Omega$ coaxial cable. The image format of the monitor can consist of 16 or 32 lines per image and of 32 or 64 characters per line.

The image memory of the monitor interface has a capacity of 2 K bytes RAM. The starting address of the image memory must be set to the address $2 \mathrm{~K}\left(0800_{\mathrm{H}}\right), 4 \mathrm{~K}\left(1000_{\mathrm{H}}\right)$ or $6 \mathrm{~K}\left(1800_{\mathrm{H}}\right)$ for the 110 S PC. The interface module must be assigned parameters in order to be able to be addressed by the CPU. These parameters take up 16 addresses in the peripheral address area and must be situated between peripheral adresses $64\left(40_{\mathrm{H}}\right)$ and $127\left(7 \mathrm{~F}_{\mathrm{H}}\right)$ in the case of the 110S PC.

For further information, see the operating instructions "Monitor interface module for the 210 micro-computer system".

Note: When using the compact modules, the plastic snap-in holders at the back of the rack must be removed.

### 2.3 Digital input/output modules

The mounting rack for the input/output modules can be attached to mounting plates or any other vertical mounting surface or mounted in cabinets with dimensions in inches or metric units.

Fig. 17 shows the configuration ( 32 module locations) of the I/O modules for one connector in the CPU. The modules are loca-tion-coded. Identical modules must not be plugged into locations with the same address, i.e. if an input module is plugged into the location with the address O , only on output module way be plugged in under the same address (see Fig. 17). The maximum I/O configuration consists of eight extra-long mounting racks or 16 short mounting racks (corresponding in both cases to 128 module locations for the input/output modules).


The length of the mounting rack is determined by the space available. If wide cabinets are used (Fig. 16), two mounting racks each with eight module locations (Fig. 17b) can be replaced by one mounting rack with 16 module locations (Fig. 17a).
In this case, the addressing is not changed and one less cable connector (3) is required. The complete addressing for the maximum configuration is shown in a diagram in the appendix (Page 30).

## 2. Installation

### 2.3 Input/output modules



Fig. 17 I/O module configuration for one CPU connector a) With extra-long mounting racks b) With short mounting racks 1 Cable to central controller, 2 Cable between two extra-long mounting racks, 3 Cabie between two short mounting racks, 4 Mounting rack, 5 Socket connector, 6 Earth connection ( $M_{\text {exx }}$ )

## The I/O modules are mounted as follows:

1. Securely mount the sectional rail. Make sure that the terminals (6) on the left hand side are connected up (earth connections). 2. Snap the socket connectors onto the rail.
2. Snap the input/output modules onto the connectors.
3. Wire up the input/output modules to sensors, contactors etc.

In order not to impede the air circulation and to allow easy access, a centre spacing of at least 300 mm should be observed between the rails


Fig. 18 Snapping an I/O module onto the mounting rack

## 3. Operation

### 3.1 Power supply (PS)



Fig. 19 Controls and displays on the power supply module



## 3. Operation

### 3.2 CPU



Fig. 20 Controls and displays elements on the CPU

| Control or display element | Function | Control action | Cause | Effect | LED |
| :---: | :---: | :---: | :---: | :---: | :---: |
| "OFF/ON" switch (1) | For service functions only | 1. Set switch to "OFF" |  | The central processor executes the microprogram cyclically (normal state) | green and orange |
|  | Starting and stopping the central processor (microprogram). In the stop state, the microprogram can be enabled for single step operation. <br> This can only be done in conjunction with a test module plugged into the central controller. | 2. Set switch to "ON" |  | The central processor is stopped immediately. The I/Os are disabled (BASP signal). Since the microprogram stop loop, which switches over the LEDs, is not processed, the green LED remains illuminated. | green and yellow |
| "Single step" button (2) | For service functions only Initiates single microinstructions <br> Can only be used in conjunction with the test module in the central controller. | Set "OFF/ON" switch to "ON". Then operate the single step pushbutton. |  | One microinstruction is executed each time the button is actuated. |  |
| Red "Stop" LED (3) | Indicates the "Stop" state of the central processor and lights up together with the yellow "Output Inhibit (BASP)" LED. |  | Mains failure, acknowledgement delay (time-out), cycle time exceeded, "Run/Stop" switch at "Stop", programmed stop, program error, etc. | The programmable controller is in the microprogrammed stop loop (no user program processing). The I/Os are disabled (BASP signal). | red and yellow |
| Green "Run" LED (4) | Indicates the run state of the central processor (cyclic processing of the microprogram). The following combinations can occur: |  |  |  |  |
|  | Green + orange LED |  | After completed cold restart routine | User program is executed | green and orange |


| Control or display element | Function | Control action | Cause | Effect | LED |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Green "Run" LED (4) | Green + red + yellow LED (only for a few seconds) |  | The mains voltage has been switched on or the "Run/ Stop" switch has been moved to the "Stop" position and then back to the "Run" position. | Cold restart routine is processed. <br> The following are reset: <br> - system data <br> - block address list <br> - non-retentive flags <br> - process I/O image <br> - memory module <br> system and user memory check | red and green and yellow |
|  | Green + yellow LED |  | The "OFF/ON" switch has been put to the "ON" position (test state of the central processor). Undefined state of the central processor. | The outputs are disabled (PESP signal) | green and yellow |
| "Run/Stop" switch (5) | Cold restart and stop of user program execution | 1. "Run" switch position (The user program is only executed if the "OFF/ON" switch is in the "OFF" position). |  | The user program is processed. The cold restart routine is started automatically on power-up. | green and orange |
|  |  | 2. "Stop" switch position |  | The central processor is brought to the microprogrammed stop loop (the user program is not executed). The outputs are disabled (BASP signal). | red and yellow |
|  |  | Caution: When initiating a cold restart, the switch should be put to "Run" then to "Stop" and back to "Run". |  |  |  |
| Orange LED (6) <br> "Program running" | Shows the cyclic processing of the user program (lights up together with the green "Run" LED) |  | Completed cold restart routine | Cyclic execution of the user program. Cycle time is max. 270 ms. | orange and green |
| Yellow "Output Inhibit" LED (7) | Indicates the state of the disabled I/Os (BASP) |  | Mains failure, acknowledgement delay (time-out), cycle time exceeded, "Run/Stop" switch at "Stop" position, programmed stop, program error | The outputs are disabled |  |
| "Reset" button (8) | Resetting of counters, timers and flags. | The reset button is pressed simultaneously with the initiation of the cold restart, i.e. putting the "Run/Stop" switch from "Stop" to "Run" |  | Resetting of all counters, timers, retentive and nonretentive flags during the cold restart routine. | red and green and yellow |

Caution: The memory submodule must not be inserted or removed with the power on.

## 4. Maintenance and repairs

### 4.1.1 S5-110S fault diagnosis

In the case of a fault, the S5-110S programmable controller should be checked in the following sequence.


Fig. 21 Sequence diagram for fault diagnosis


## 4. Maintenance and repairs

### 4.1.3 Interrupt stack

### 4.1.3 Interrupt stack

The interrupt stack (ISTACK) is a stack register in which the system program stores information when the PC enters the stop state.

1. In the case of "Output ISTACK" with the 670/675 programming unit, the control bits (Fig. 23a) which are contained in the system data words SD 5 to SD 7 (absolute address EAOA ${ }_{H}$ to $E A O E_{H}$ ) are output in the first part. The control bits have the following significance:
a) PBS SCH: shift block before PROM
b) BST SCH: shift block
c) SCHTAE: shift operation
d) ADR BAU: address list construction
e) SPABBR: memory shift discontinuation
f) NAU AS: mains failure for interface modules
g) QUITT: acknowledgement for PBS SCH
h) STOZUS: the PC is in the microprogrammed stop loop (external request/cold restart)
i) STOANZ: the PC is in the microprogrammed STOP state (internal request/cold restart)
j) NEUSTA: the PC is in the cold restart (new start) routine
k) BATPUF: back-up battery for internal RAM memory is ok
I) BARB: the PC is in the single step mode
m) BARB END: the PC indicates the end of the single step mode
n) MAFEHL: group alarm for machine error word SD 7
o) EOVH: interrupt input byte $\varnothing$ present
p) ASPNPR: only EPROM user memory present
q) ASPNRA: only RAM user memory present
r) KOPFNI: block header cannot be interpreted (erase, boot and cold restart)
s) PROEND: shift before EPROM use ended (cold restart)
t) PADRFE: addressing error in EPROM memory (reset, boot and cold restart)
u) ASPLUE: address gap in user memory (erase, boot and cold restart)
v) RAMADFE: addressing error in RAM memory (erase, boot and cold restart)
w) KEINAS: no user memory module inserted
x) SYNFEH: synchronization error (erase, boot and cold restart)
y) NINEU: cold restart not possible (erase, boot and cold restart)
z1) SUMF: sum error in system program (cold restart)
z2) URLAD: boot (reset and boot)


Fig. 23a Interrupt stack, part 1 (control bits) NB signifies unassigned
2. The interrupt stack proper is output in the second part of the ISTACK (Fig. 23b)
The "Cause of interrupt" is displayed in the interrupt condition code word (SD 214 absolute address EBAC ${ }_{H}$ ) - one of the most important debugging aids. The mnemonics have the following significance:
a) STOPS: "Run/Stop" switch is in stop position
b) STUEB: block stack overflow
c) NAU: mains voltage failure
d) QVZ: acknowledgement delay (time-out)
e) ZYK: cycle time exceeded
f) BAU: battery failure
g) NNN: programming error; statement is not permissible in the 110 S or block number is not permitted or data block not present
h) STS: programmable STOP

### 4.1.3 Interrupt stack <br> 4.1.4 System parameters

3. The "Result bits" (absolute address $E B A A_{H}$ ) show the state the PC was in when the interrupt occurred.
a) FLG1 (CC1); FLG0 (CC0): condition code for arithmetic, logical and shift operations
b) OVFL: condition code for arithmetic overflow
c) OR: condition code for OR memory
d) RLO: condition code for result of logic operation
e) FOP: condition code first scan

The "Brackets" line (SD 209 - SD 212) indicates which bracket level the PC was in when the interrupt occurred. The condition codes for OR, RLO and AND/OR are displayed.
The contents of the accumulator (SD 203 and SD 204), the step address counter SAC (SD 206), the block stack pointer BK-STP (SD 207) and the initial address of the data block selected DB-ADD (SD 208) at the time the interrupt occurred are also displayed.


Fig. 23b Interrupt stack, part 2

### 4.1.4 System parameters

The system parameters provide information about the PC and the memory configuration.

1. Release of the PC software
2. CPU identifier
3. Release of the PU and IM software
4. Memory configuration (absolute addresses)
a) Input modules ( $/ / \mathrm{O}$ memory $\mathrm{FO} 00_{\mathrm{H}}$ to $\mathrm{F} 07 \mathrm{~F}_{\mathrm{H}}$ )
b) Output modules (I/O memory F080 ${ }_{H}$ to $\mathrm{FOFF}_{\mathrm{H}}$ )
c) Process image of the inputs $E F 00_{H}$ to $\mathrm{EF7F}_{\mathrm{H}}$

e) Retentive flags $E E 00_{H}$ to $E E 7 F_{H}$

Non-retentive flags $\mathrm{EEPO}_{\mathrm{H}}$ to $\mathrm{EEFF}_{\mathrm{H}}$
f) Timers $\mathrm{EDOO}_{\mathrm{H}}$ to $\mathrm{EDFF}_{\mathrm{H}}$
g) Counters $\mathrm{ECOO}_{\mathrm{H}}$ to $\mathrm{ECFF}_{\mathrm{H}}$
h) ST memory area (system data area) EA00 $\mathrm{H}_{\mathrm{H}}$ to $\mathrm{EBFF}_{\mathrm{H}}$
4. Maintenance and repairs

### 4.2 Connector pin assignments in the central controller backplane

| Signal name | Connector with pin assignment |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Power supply X 11 | Indicating unit X 12 | CPU-X 1 | Diagnostics-X 3 | RAM-X 5 | IM 511-X 7 | IM 512-X 9 |
| $\begin{aligned} & +5 \mathrm{~V} \\ & \mathrm{M} \\ & \text { E/A } \\ & \text { SAZLL } \end{aligned}$ | $\begin{aligned} & 1 / 2 \\ & 3 / 4 \end{aligned}$ |  | $\begin{array}{r} \mathrm{Z2}= \\ \mathrm{b} 2= \\ \mathrm{d} 2= \\ \mathrm{f} 2= \end{array}$ | Z 2 b 2 d 2 f 2 | $-\mathrm{Z2}$ | $-\mathrm{Z2}-\mathrm{b} 2-$ | $\begin{aligned} & \mathrm{Z} 2 \\ & \mathrm{~b} 2 \end{aligned}$ |
| $\varnothing$ 2TTL PESP UBATT SAZLH |  | b5 | $\begin{array}{r} \mathrm{Z4} \\ \mathrm{~b} 4 \\ -\mathrm{d} 4 \\ \mathrm{f} 4 \end{array}$ | $-\mathrm{Z} 4$- <br> -f 4 | $\begin{aligned} & \mathrm{Z} 4- \\ & -\mathrm{b} 4- \\ & \mathrm{d} 4 \end{aligned}$ | $\begin{array}{r} \mathrm{Z} 4 \\ -\mathrm{b} 4 \\ =\mathrm{d} 4 \end{array}$ | $\begin{aligned} & \quad \mathrm{Z41}) \\ & \mathrm{b}^{2} \\ & \mathrm{~d} 4 \end{aligned}$ |
| CPKL <br> ADB $\varnothing$ <br> ADB12 <br> SAZRL |  | a2 | $\begin{aligned} & \mathrm{Z} 6- \\ & \mathrm{b} 6- \\ & \mathrm{d} 6 \\ & \mathrm{f}- \end{aligned}$ | $\begin{aligned} & -\mathrm{Z6} \\ & -\mathrm{b} 6 \\ & -\mathrm{d} 6 \\ & \mathrm{f} 6 \end{aligned}$ | $\begin{aligned} & \mathrm{Z} 6 \\ & \mathrm{~b} 6 \\ & \mathrm{~d} 6 \end{aligned}$ | $\begin{array}{r} \mathrm{Z} 6 \\ \mathrm{~b} 6 \\ \mathrm{~d} 6 \end{array}$ | $\begin{array}{r} \mathrm{Z} 6 \\ \mathrm{~b} 6 \\ \mathrm{~d} 6 \end{array}$ |
| EMR <br> ADB1 <br> ADB13 <br> SAZRH |  |  | $\begin{aligned} & \mathrm{Z} 8 \\ & \mathrm{~b} 8 \\ & \mathrm{~d} 8 \\ & \mathrm{f} 8 \end{aligned}$ | Z 8 b 8 d 8 f 8 | $\begin{aligned} & -\mathrm{Z8}= \\ & -\mathrm{b} 8- \\ & -\mathrm{d} 8 \end{aligned}$ | $\begin{aligned} & -\mathrm{Z} 8- \\ & -\mathrm{b} 8 \\ & \mathrm{~d} 8- \end{aligned}$ | $\begin{array}{r} \mathrm{Z} 8 \\ \square \mathrm{~b} 8 \\ \mathrm{~d} 8 \end{array}$ |
| EMW <br> ADB2 <br> ADB14 <br> SAZL |  |  | $\begin{aligned} & \text { Z10- } \\ & \text { b10- } \\ & \text { d10 } \\ & \text { f10 } \end{aligned}$ | $\begin{array}{r} \mathrm{Z} 10- \\ \mathrm{b} 10= \\ \mathrm{d} 10= \\ \mathrm{f} 10 \end{array}$ | $\begin{array}{r} \mathrm{Z} 10 \\ -\mathrm{b} 10 \\ \mathrm{~d} 10 \end{array}$ | $\begin{array}{r} Z \\ Z 10 \\ \mathrm{~b} 10 \\ \mathrm{~d} 10 \end{array}$ | $\begin{array}{r} Z \\ Z \\ \mathrm{Z} 10 \\ -\mathrm{d} 10 \\ \hline \end{array}$ |
| $\overline{\text { RDY }}$ <br> ADB3 <br> ADB15 <br> SAZS |  |  | $\begin{aligned} & \text { Z12 } \\ & \text { b12 } \\ & \text { d12 } \\ & \text { f12 } \end{aligned}$ | $-\mathrm{Z} 12=$ | $\begin{array}{r} -\mathrm{Z} 12- \\ \mathrm{b} 12- \\ \mathrm{d} 12- \end{array}$ | $\begin{array}{r} -\mathrm{Z} 12 \\ \mathrm{~b} 12 \\ \mathrm{~d} 12 \end{array}$ | $\begin{array}{r} \mathrm{Z} 12 \\ \mathrm{~b} 12 \\ \mathrm{~b} 12 \end{array}$ |
| $\begin{aligned} & \text { DB } \varnothing \\ & \text { ADB4 } \\ & \hline \text { TXR1 } \\ & \text { INC } \end{aligned}$ |  |  | Z14 <br> b14 <br> d14 <br> f14 | Z14 b14 d 14 f 14 | $\begin{aligned} & \text { Z14- } \\ & -\mathrm{b} 14- \\ & \text { d } 14- \end{aligned}$ | $\begin{array}{r} \mathrm{Z} 14- \\ =\mathrm{b} 14- \\ \mathrm{d} 14- \end{array}$ | $\begin{array}{r} \mathrm{Z} 14 \\ \mathbf{b} 14 \\ \mathbf{~} 144 \end{array}$ |
| DB1 <br> ADB5 <br> S-Test 0 <br> DEC |  |  | $\begin{aligned} & \text { Z16 } \\ & \text { b16 } \\ & \text { d16 } \\ & \text { f16 } \end{aligned}$ | Z 16 b 16 d 16 f 16 | $\begin{array}{r} \mathrm{Z} 16- \\ -\mathrm{b} 16- \\ \mathrm{d} 16- \end{array}$ | $\begin{array}{r} \mathrm{Z} 16- \\ \mathbf{Z} 16- \\ \mathrm{C} 16- \end{array}$ | $\begin{array}{r} Z \\ Z \\ \text { Z16 } \\ - \\ \text { d } 16 \end{array}$ |
| $\begin{aligned} & \text { DB2 } \\ & \text { ADB6 } \\ & \text { S-Test } 1 \end{aligned}$ |  |  | Z18 <br> b18 <br> d18 <br> f18 | Z18 b18 d18 f18 | $\begin{array}{r} \mathrm{Z} 18- \\ \mathrm{b} 18- \\ \mathrm{d} 18- \end{array}$ | Z 18 b 18 d 18 | $\begin{array}{r} \mathrm{Z} 18 \\ \mathrm{~b} 18 \\ \mathrm{~d} 18 \end{array}$ |
| $\begin{aligned} & \text { DB3 } \\ & \text { ADB7 } \\ & \frac{\text { RXR2 }}{\text { IMW }} \end{aligned}$ |  |  | $\begin{aligned} & \mathrm{Z} 20- \\ & \mathrm{b} 20= \\ & \mathrm{d} 20= \\ & \mathrm{f} 20- \end{aligned}$ | Z 20 b 20 d 20 f 20 | $\begin{array}{r} \mathrm{Z} 20 \\ \mathrm{~b} 20 \\ \mathrm{~d} 20 \end{array}$ | $\begin{array}{r} \mathrm{Z} 20 \\ -\mathrm{b} 20 \\ \\ \mathrm{~d} 20 \end{array}$ | $\begin{array}{r} \mathrm{Z} 20 \\ -\mathrm{b} 20 \\ \mathrm{~d} 20 \end{array}$ |
| DB4 <br> ADB8 <br> $\frac{\text { S-Test }}{\text { BASPI }}$ |  |  | $\begin{aligned} & \text { Z22 } \\ & \text { b22 } \\ & \text { d22 } \\ & \text { f22 } \end{aligned}$ | Z 22 b 22 d 22 f 22 | $\begin{array}{r} \mathrm{Z} 22- \\ \mathrm{b} 22 \\ \mathrm{~d} 22- \end{array}$ | $\begin{array}{r} -\mathrm{Z} 22 \\ -\mathrm{b} 22 \\ \mathrm{~d} 22 \end{array}$ | $\begin{array}{r} \mathrm{Z} 22 \\ \mathrm{~b} 22 \\ \mathrm{C} 22 \end{array}$ |
| DB5 <br> ADB9 <br> BASF <br> ANZ $\varnothing$ |  |  | $\begin{aligned} & \text { Z24 } \\ & \text { b24 } \\ & \text { d24 } \\ & \text { f24 } \end{aligned}$ | $\begin{array}{r} \mathrm{Z} 24- \\ \mathrm{b} 24 \\ -\mathrm{d} 24 \\ \mathrm{f} 24 \end{array}$ | $\begin{aligned} & -\mathrm{Z} 24 \\ & -\mathrm{b} 24 . \end{aligned}$ | $\begin{aligned} & -\mathrm{Z} 24 \\ & -\mathrm{b} 24 \end{aligned}$ | $\begin{array}{r} \text { Z24 } \\ \text { b24 } \end{array}$ |
| DB6 <br> ADB1 $\varnothing$ OVF ANZ1 |  |  | $\begin{aligned} & \mathrm{Z} 26- \\ & \mathrm{b} 26 \\ & \text { d26 } \\ & \text { f26 } \end{aligned}$ | Z 26 b 26 d 26 f 26 | $\begin{aligned} & -\mathrm{Z} 26 \\ & \mathrm{~b} 26 \end{aligned}$ | $\begin{aligned} & \mathrm{Z} 26- \\ & -\mathrm{b} 26- \end{aligned}$ | $\begin{array}{r} \text { Z26 } \\ \text { Z26 } \end{array}$ |
| DB7 <br> ADB11 <br> DSI <br> QVZM |  | b2 | $\begin{array}{r} \mathrm{Z} 28 \\ \mathrm{~b} 28 \\ -\mathrm{d} 28 \\ \mathrm{f} 28 \end{array}$ | - $\mathrm{Z} 28=$ | $\begin{array}{r} \mathrm{Z} 28 \\ \mathrm{~b} 28 \\ \mathrm{~d} 28 \end{array}$ | $\begin{array}{r} \mathrm{Z} 28= \\ \mathrm{b} 28= \\ \mathrm{d} 28= \end{array}$ | $\begin{array}{r} \mathrm{Z} 28 \\ \mathrm{~b} 28 \\ \mathrm{~d} 28 \end{array}$ |
| $\overline{\text { MWPH }}$ BASP MEMSEL QVZVM |  |  | $\begin{aligned} & \text { Z30 } \\ & \text { b30 } \\ & \text { d30 } \\ & \text { f30 } \end{aligned}$ | $\begin{array}{r} \mathrm{Z} 30 \\ \mathrm{~b} 30 \\ \hline \mathrm{f} 30 \end{array}$ | $\begin{array}{r} -\mathrm{b} 30 \\ -\mathrm{d} 30 . \end{array}$ | $\begin{aligned} & -b 30- \\ & d 30- \end{aligned}$ | $\begin{array}{r} \text { b30 } \\ \text { d30 } \end{array}$ |
| $\begin{aligned} & \overline{\text { CSPAEV }} \\ & \text { M } \\ & \hline \text { BASPA } \\ & \text { QVZHM } \end{aligned}$ | 3/4 | a3 | $\begin{array}{r} \text { Z32 —— } \\ -\mathrm{b} 32 \\ -\mathrm{d} 32 \\ \mathrm{f} 32 \end{array}$ | Z32 b32 d32 f32 | $=\mathrm{b} 32$ | $— \mathrm{~b} 32-$ | $\begin{array}{r} \text { b32 } \\ \text { d32 } \end{array}$ |

4. Maintenance and repairs
4.2 Connector pin assignments in the central controller backplane


Fig. 24b Lower connector row of the CC backplane

## 4. Maintenance and repairs

### 4.3 Connector pin assignments of the 110 bus

### 4.3 Connector pin assignments of the 110 bus

Fig. 25 shows the pin assignments of the connectors for the 110 bus for each mounting rack. If the $\mathrm{I} / \mathrm{O}$ bit is " 0 ", only the inputs are addressed, whereas if it is "1", only the outputs are addressed. The addressing of each module on the mounting rack is carried out using bits $\mathrm{Z1}, \mathrm{Z2}$ and F0 to F7 (see Fig. 26). The individual inputs/outputs on the modules are selected by bits K0 to K2.

I/O Enable the input ( $=$ " 0 ") or output modules (= " 1 ") $\mathrm{Z1}, \mathrm{Z} 2$ and
F0 to F7 Addressing of the input/output modules
K0 to K2 Addressing of the inputs or outputs on the selected modules
$\mathrm{D}_{\text {IN }} \quad$ DATA IN, signal state of inputs
Dout DATA OUT, signal state for setting the outputs
RI Initialising pulse (resets output modules)
IR Interrupt group signal of the corresponding digital input module
M OVDC

## Socket connectors



Fig. 25 Pin assignments of the socket connector on the 110 bus


Fig. 26a Coding of the 110 bus with short mounting racks


| Description | Order No． | Weight approx． kg |
| :---: | :---: | :---: |
| Housing，complete with power supply $220 \mathrm{VAC} / 240 \mathrm{~V} \mathrm{AC} / 5 \mathrm{~V}$ DC | 6ES5 932－3SA12 | 9.5 |
| Housing，complete with power supply $115 \mathrm{VAC} / 5 \mathrm{~V} D C$ | 6ES5 932－3SA22 | 9.5 |
| Housing，complete with power supply 24 VDC／5 V DC | 6ES5 932－3SA32 | 6.7 |
| CPU | 6ES5 902－3SA12 | 1.0 |
| Memory submodul for CPU <br> a）with EPROM for 2 K statements <br> b）with EPROM for 4 K statements <br> c）with EPROM for 8 K statements | 6ES5 911 －0AA31 6ES5 911－0AA42 6ES5 911 －0AA52 | 0.06 |
| 340 Memory module＊ RAM for 8 K statements RAM for 16 K statements | $\begin{aligned} & \text { 6ES5 340-5AA11 } \\ & \text { 6ES5 340-5AA21 } \end{aligned}$ | $\begin{aligned} & 0.3 \\ & 0.3 \end{aligned}$ |
| 350 Memory module＊ <br> RAM for 4 K statements | 6ES5 350－5AA21 | 0.3 |
| Associated EPROM submodules＊ <br> 371 for 2 K statements <br> 371 for 4 K statements <br> 371 for 8 K statements | 6ES5 371－0AA31 6ES5 371－0AA41 6ES5 371－0AA51 | $\begin{array}{\|l\|} \hline 0.07 \\ 0.07 \\ 0.07 \end{array}$ |
| 511 PU interface module＊ | 6ES5 511－5AA12 | 0.3 |
| 512C Interface module＊ for computer，keyboard printer and CRT monitor | 6ES5 512－5BC12 | 0.3 |
| 302 Serial peripheral interface module＊ （can be plugged into central controller） | 6ES5 302－5AA11 | 0.3 |
| 731 Cable connector＊ between 670 PU and 511 IM | 6ES5 731－0ロロロ0 |  |
| 732 Cable sonnector between 512 IM and 3913 keyboard printer（TTY）＊ <br> 3914 keyboard printer（PT80，TTY）＊ <br> 3964 Data transmission controller （PROMEA）＊ <br> 3974 （TTY）＊Alphanumeric display unit <br> 3974 R（TTY）＊Alphanumeric display unit <br> 512 Interface module（S5－S5 interface TTY）＊ <br> 3964 Data transmission controller＊ <br> Length of 731 and 732 cable connectors 1 m | 6ES5 732－1ロロロ0 <br> 6ES5 732－2ロロロ0 <br> 6ES5 732－3 $\square \square \square 0$ <br> 6ES5 732－4ロロロ0 <br> 6ES5 732－5 $\square \square \square 0$ <br> 6ES5 732－6ロロロ0 <br> 6ES5 732－7ロロロ0 |  |
| 2 m | BCO |  |
| 4 m | BEO |  |
| 5 m | BFO |  |
| 10 m | CBO |  |
| 20 m | CCO |  |
| 40 m | CEO |  |
| 80 m | CJO |  |
| 100 m | DB0 |  |
| 200 m | DC0 |  |
| 400 m | DEO |  |
| 800 m | DJo |  |
| 1000 m | EBO |  |
| 736 Cable connector＊ <br> Length 3.20 m ；for connecting a PT 80 （TTY） printer to the 670／675 PU | 6ES5 736－0BD20 |  |
| 737 Cable connector＊ <br> Length 3.20 m ；for connecting a printer（V．24） to the 670／675 PU | 6ES5 737－0BD20 |  |


| Description | Order No． | Weight approx． kg |
| :---: | :---: | :---: |
| 670C Programming unit ${ }^{*}$ <br> consisting of： <br> video monitor with UV erasing unit and <br> printer interface <br> German labelling <br> English labelling <br> French labelling | 6ES5 670－0CA21 6ES5 670－0CB21 6ES5 670－0CC21 | 20 |
| 675 programming unit ${ }^{\star}$ <br> consisting of： <br> video monitor with printer interface but without UV erasing unit | 6ES5 675－0UA11 | 18 |
| Mounting rack with 8 module locations with 16 module locations | $\begin{aligned} & \text { 6ES5 710-OSA11 } \\ & \text { 6ES5 710-0SA41 } \end{aligned}$ | $\begin{aligned} & 1.53 \\ & 2.56 \end{aligned}$ |
| Cable connector，shielding between CC and $\mathrm{I} / \mathrm{Os}, 0.9 \mathrm{~m}$ between CC and $\mathrm{I} / \mathrm{Os}, 1.5 \mathrm{~m}$ between CC and $\mathrm{I} / \mathrm{Os}, 2.5 \mathrm{~m}$ | 6ES5 716－0AK00 6ES5 716－0BB50 6ES5 716－0BC50 |  |
| Cable connector，shielded between short mounting racks， 0.8 m | 6ES5 717－0B300 |  |
| Cable connector，shielded between extra－long mounting racks， 0.5 m | 6ES5 718－0AF00 |  |
| Input modules，each with 8 inputs |  |  |
| Digital input module 24 V DC | 6ES5 400－7AA13 | 0.4 |
| Digital input module with group signal $24 \mathrm{~V} \text { DC }$ | $\text { 6ES5 } 401 \text {-7AA13 }$ |  |
| Digital input module $115 \mathrm{~V} \mathrm{AC} / \mathrm{DC}$ <br>  $220 \mathrm{~V} \mathrm{AC} / \mathrm{DC}$ <br>  $48 \mathrm{~V} \mathrm{AC} / \mathrm{DC}$ | $\begin{aligned} & \text { 6ES5 405-7AB11 } \\ & \text { 6ES5 405-7AB21 } \\ & \text { 6ES5 405-7AB31 } \end{aligned}$ |  |
| Output modules，each with 8 outputs <br> Digital output module <br> $24 \mathrm{VDC}, 2 \mathrm{~A}$ <br> $48 \mathrm{VDC}, 0.5 \mathrm{~A}$ <br> $115 \mathrm{VAC}, 2 \mathrm{~A}$ <br> $220 \mathrm{VAC}, 2 \mathrm{~A}$ <br> $48 \mathrm{VAC} / 24 \mathrm{VAC}, 2 \mathrm{~A}$ | 6ES5 410－7AA11 <br> 6ES5 410－7AA21 <br> 6ES5 415－7AB11 <br> 6ES5 415－7AB21 <br> 6ES5 415－7AA31 | $0.68$ |
| Relay output module <br> up to $30 \mathrm{~V} \mathrm{AC/DC/500} \mathrm{~mA}$ up to 250 V AC／DC／1．5 A | $\begin{aligned} & \text { 6ES5 417-7AA11 } \\ & \text { 6ES5 417-7AA21 } \end{aligned}$ | 0.7 |
| $333 C$ Service unit ${ }^{*}$ <br> without connector <br> Standard function blocks for 333C service unit，on mini－diskette | 6ES5 333－0AC21 <br> P71200－A0121－ A253－04 | 3.0 |
| Fuses for output modules <br> $220 \mathrm{~V} \mathrm{AC}, 6.3$ A fast <br> $115 \mathrm{VAC}, 6.3 \mathrm{~A}$ fast <br> 24 V DC， 2.5 A fast | 261312 GWA 261312 GWA 261131 GWA |  |
| Power supply blocks $\begin{gathered} 220 / 240 \mathrm{~V} \mathrm{AC}, 0.8 \mathrm{~A} \text { slow } \\ 115 \mathrm{~V} \mathrm{AC}, 1.6 \mathrm{~A} \text { slow } \end{gathered}$ | 256263 GWE 256255 GWE |  |
| ```Power supply modules for external 24 V supply 220 V AC/24 V DC; 0.8 A 115 V AC/24 V DC; 0.8 A``` | $\begin{aligned} & \text { 6ES5 } 931 \text {-7AA11 } \\ & \text { 6ES5 } 931 \text {-7AA21 } \end{aligned}$ | $\begin{aligned} & 0.7 \\ & 0.7 \end{aligned}$ |
| Back－up battery（Li） 3.4 V | 6ES5 980－0AA31 |  |

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Fig. 27a Maximum configuration of the I/Os with extra-long mounting racks and addressing of the input/output modules.


Fig. 27b Maximum configuration of the I/O modules with short mounting racks and addressing of the input/output modules

## SIEMENS


[^0]:    ＊Order from GWK

